# Public Release Report for the Morton Salt Energy Savings Assessment:

1. Introduction:

   This plant produces packaged and bulk NaCl and KCl products. NaCl is mined at the site as solid granular material or obtained as a brine produced by pumping water into and out from underground salt formations. KCl is imported for processing and packaging. One gas-fired boiler supplies superheated steam to a turbine-generator which produces about 50% of the plant's electricity needs. Low pressure steam exiting the turbine or a pressure reducing station supplies a multiple-effect evaporation system for water removal from brine. Salt grinding and packaging operations are powered mainly by electricity.

2. Objective of ESA:

   The objective of this ESA was twofold:
   a) To train company/plant personnel in the use of the DOE Steam Tool software.
   b) To perform a "training assessment" of plant equipment and processes leading to the recommendation of measures for achieving substantial plant energy savings.

3. Focus for Assessment:

   The ESA focused on plant steam production and use with an emphasis on natural gas as a boiler fuel.

4. Approach for ESA:

   The ESA Expert worked directly and continuously on-site with company specialists on energy conservation (Fendt) and principal process technology (Gimelfarb). Plant process managers and operators supplied technical data and information needed to utilize the Steam Tools to evaluate several natural gas-saving project opportunities. A plant inspection provided the opportunity to make measurements needed for SSAT simulations and to identify potential energy-saving measures.

5. General Observations of Potential Opportunities:

   a) Purchased energy annual consumption and cost:

      <u>Natural gas and electricity</u>
      Consumption (11/04 - 10/05): 561,820 x $10^6$ BTU/yr.
      Cost: $4,821,215

   b) SSST Results:

      Steam system profiling: 49/90 pts. = 54% (DOE database plants: 59%)
      Steam system operating practices: 81/140 pts. = 58% (DOE database plants: 74%)
      Boiler plant operating practices: 58/80 pts. = 73% (DOE database plants: 62%)
      Distribution, end use, recovery, operating practices: 20/30 pts. = 33% (DOE database plants: 54%)

Overall score: 208/340 pts. = 61% (DOE database plants: 66%)

6. Energy Saving Opportunities:

    1. Idle repaired turbine and lower steam pressure

    Due to an atypically high ratio of purchased natural gas to electricity energy cost, it is advantageous to idle the 1,500 kW turbine generator (undergoing repair) and to purchase all needed electricity. With the turbine idled, boiler steam pressure may be reduced moderately to achieve substantial energy and cost savings (SSAT-simulated results presented above). It is highly recommended that the boiler manufacturer or a boiler service company be contacted to determine the minimum lower-level steam pressure which can be used without the causation of (potentially serious) detrimental effects (e.g. boiler water tube overheating and failure, system water hammer). (**Near-term opportunity;** potential gas saving: 10%)

    2. Minimize steam use for evaporation

    Electricity can be used as an energy source to facilitate evaporation of water from salt. This will allow for a significant reduction in the mass flow of steam to the evaporator units resulting in reduced boiler steam load. (**Medium-term opportunity**; potential gas savings: 85%)

    3. Improve steam trap maintenance

    Due to the advanced age of most of the plant steam system components, maintenance personnel spend most of their available time making needed repairs. Largely for this reason, there has not been a systematic investigation of steam traps for many years. Based on industrial data imbedded in SSAT, a substantial energy saving (due mainly to the elimination of steam leaks) would result from the institution of a high quality steam trap maintenance program. It is recommended that an experienced outside vendor be employed to set-up a steam trap maintenance program and to test and repair system traps. (**Near-term opportunity**; potential gas savings: 0.8%)

    4. Feedwater heating with blowdown:

    Currently, blowdown flash is recovered to the low pressure steam system. However, hot liquid residual is available for feedwater heating. An SSAT simulation demonstrated significant savings. (**Medium-term opportunity**; potential gas savings: 0.6%)

5. Improved insulation:

   The extent and condition of steam system insulation is very good overall. However, numerous valve bodies and fittings are currently uninsulated. An SSAT simulation demonstrated a significant savings for the insulation of the remaining uninsulated steam system components. (**Near-term opportunity**; potential gas savings: 0.4%)

   Summary of potential gas savings:
   Near-term measures: 65,760 x $10^6$ Btu/yr.
   Medium-term measures: 431,482 x $10^6$ Btu/yr.
   Long-term measures: 0%

7. Management Support and Comments:

   The plant manager and the plant manufacturing manager met with the ESA Expert and visiting company specialists in several sessions over a three-day period to clarify plant operations and concerns. Additionally, several plant process operators participated in discussions sessions to clarify plant procedures and to supply data needed for project analysis. Plant management personnel were highly supportive of the ESA and rated the value of the assessment as substantially useful in guiding energy conversation and associated cost reduction actions.

8. DOE Contact at plant/company

   Plant: Phillip W. Carleton, Plant Manager (points of contact above)

   Company (Rohm and Haas): Frederick P. Fendt, Distinguished Engineer, 3100 State Road, Croydon, PA 19021; (215) 785-7661; ffendt@hohmhaas.com